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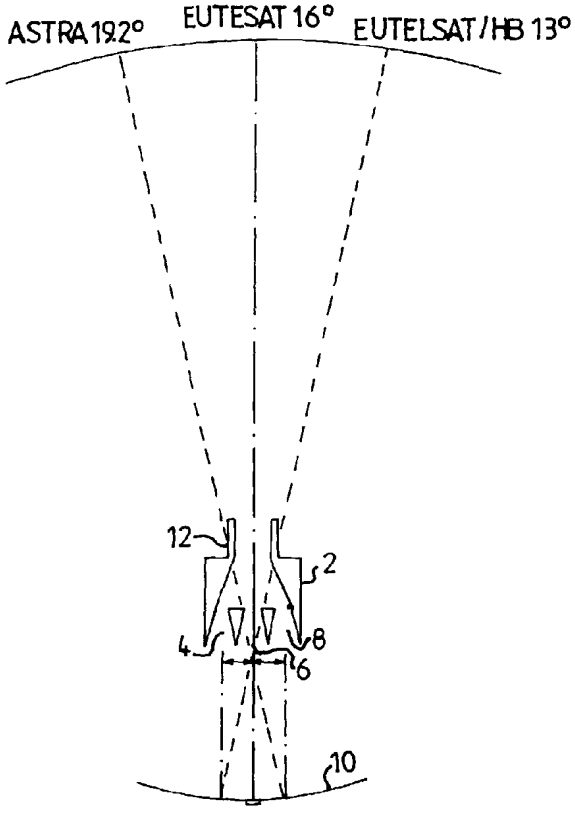
(54) Title: SATELLITE COMMUNICATION SYSTEM



(57) Abstract: A communication system for satellite signals intended to be used in conjunction with a parabolic reflector (10), comprising a feeder element (2) and a control arrangement (16). The feeder element is provided with at least one antenna element (4, 6, 8), preferably a feeder horn, and it is adapted to receive television signals and to receive or transmit Internet signals. The control arrangement (16) is adapted to separate the television signals from the Internet signals and to select and forward one television signal for reception and to select and forward one Internet signal for reception or transmission, respectively. The invention enables reception of television signals from one satellite and simultaneous communication with the Internet via the same or another satellite, with one and the same parabolic antenna.

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Satellite Communication System

TECHNICAL FIELD

The present invention relates to a satellite communication system to be used with a parabolic reflector, arranged to simultaneously receive television signals and to receive or transmit Internet signals via the same or different satellites.

BACKGROUND OF THE INVENTION

Reception of television signals and Internet signals from satellites may take place by means of parabolic antennas directed towards the satellite from which signal reception is desired. At present, a great number of satellites exist, which are located in geo-stationary orbits, relatively close to each other. One parabolic antenna may, however, receive signals from several satellites, without having to change its direction. This is achieved by placing several feeder horns in the focal plane of the parabolic reflector, on a distance from each other that corresponds to the angular distance between the satellites from which signal reception is desired. Standard designed feeder horns may comprise a horn to be directed towards the parabolic reflector, whereby the feeder horn is in focus of the signal from the satellite in question. The narrow part of the horn is transformed into a cylindrical waveguide for the reception of satellite signals. The feeder horns may comprise separate antennas for the reception of signals with vertical and horizontal polarizations, respectively, or circular polarization. The microwave signals from the feeder horns are amplified and frequency-down-converted into a range of frequency of 1 - 2 GHz in a so called LNB (Low Noise Block down converter), to be forwarded to a reception box located in connection with a TV or computer. A disadvantage with this design is that if signal reception is desired from satellites located adjacent to each other, the parabolic antenna has to be redirected, possibly by means of a motor.

One possible solution for the reception of television signals from several adjacent satellites is described in the Swedish patent no. 516 053. This patent document shows a satellite reception system comprising a parabolic antenna and a feeder element provided with two or more feeder horns for the receptions of signals from two or more adjacent satellites. A signal from one of the feeder horns is forwarded through the LNB to a conventional reception box located in connection with a TV. The feeder element comprises blocking means in order to block the feeder horns from the satellites from which no reception of television signals is desired.

In homes, places of work and schools provided with a parabolic antenna for the reception of TV-channels via a satellite, there is, in general, also a need to communicate over the Internet. In particular, not as many possible means exist today for a fast Internet communication, so called broadband, in villas and other single-family houses as in apartment houses. If reception of Internet signals, as well as television signals, from a satellite is desired, it is advantageous to achieve a satellite communication system for simultaneous reception of television signals and Internet signals independently of each other, via the same parabolic antenna. A further advantage is if this system can be applied on existing parabolic antennas intended for reception of television signals. It is also an advantage if the parabolic antenna can receive signals from several adjacent satellites without any re-directing of the parabolic antenna.

Prior art in this field is shown in US 5,565,805, which describes satellite communication by means of several parabolic reflectors, see figure 2, and in US 2003/0034165, which describes a system for telephone, computer and television communication via satellites by means of several parabolic reflectors 3 - 3N, which are controlled from a central hub 2, see figure 1. None of these documents describes, however, a communication system for satellite signals, by means of which

television signals as well as Internet signals can be received independently of each other from the same satellite or from different satellites, or Internet signals transmitted, by means of only one parabolic reflector, which may consist of an already existing parabolic antenna.

Thus, an object with this invention is to achieve a communication system for Internet signals as well as television signals, which, via one and the same parabolic antenna, simultaneously can receive television signals and receive or transmit Internet signals from the same satellite or from different satellites.

DESCRIPTION OF THE INVENTION

This and other objects are achieved by a satellite communication system according to the appended claims.

This communication system for satellite signals is intended for a parabolic reflector and comprises a feeder element and a control arrangement. The feeder element is provided with at least one antenna element arranged to receive television signals from one satellite and simultaneously receive or transmit Internet signals from or to the satellite. The antenna elements, included in the feeder element, are arranged to communicate with one satellite each, via the parabolic reflector, and the control arrangement is arranged to receive television signals and Internet signals from the antenna elements, to separate the television signals from the Internet signals and to select and forward a television signal from one satellite, select and forward an Internet signal from the same or from a different satellite, or to forward an Internet signal for transmission.

The feeder element may be provided with at least two antenna elements for communication with more than one satellite.

The antenna elements may comprise feeder horns.

The control arrangement comprises controllable switches regulating which television signal and which Internet signal, respectively, to be forwarded.

To enable an easy mounting of a feeder element on a parabolic antenna, the feeder element may be provided with a mounting part of which the shape is fitted to be mounted on an existing parabolic antenna.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described more closely with reference to the enclosed drawings, of which:

- Figure 1 schematically shows a view of a cross section of a parabolic antenna for the reception of satellite signals, comprising a feeder element with three feeder horns.

- Figure 2 schematically shows an embodiment of a micro head according to the invention, and

- Figure 3 schematically shows an embodiment of a control arrangement according to the invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

Figure 1 schematically shows parts of a first embodiment of a satellite communication equipment for TV and Internet, provided with a feeder element 2 comprising three feeder horns 4, 6, 8 and LNB:s (Low Noise Block down converter), not shown, for the reception of television signals and for the reception and transmission of Internet signals. The feeder element receives signals from adjacent satellites via a parabolic reflector 10. In this figure, the indicated satellites are ASTRA, EUTELSAT, and EUTELSAT/HB, which are located with an angular distance of approximately 3 degrees between each other. A control

arrangement, not disclosed in figure 1, comprises filter, amplifier and switches and separates the television signals and the Internet signals from each other and selects which one, or which ones, of the signals from the different feeder horns that is to be fed to one or more LNB:s. Via one or more outputs, the separated, amplified and frequency-down-converted television signals and Internet signals are transferred in a conventional way to one common or to two separate communication boxes for TV and Internet, and further to receivers for TV and to receivers and transmitters, respectively, for the Internet. Such receivers may, for example, comprise a TV or a computer, or optionally a TV for the reception of television signals and a mobile or stationary computer for the communication with the Internet. The control arrangement also enables the transmission of Internet signals from a TV or a computer, via the communication box and the feeder horn communicating with the Internet.

In the embodiment of the feeder element 2 according to the figures 1 and 2, it is provided with three feeder horns 4, 6 and 8, but the number of horns may be varied depending on from how many different satellites signal reception is desired; it is, however, provided with at least one feeder horn. According to another embodiment of the feeder element, the antenna elements for reception of television signals and for communication with the Internet may be of another antenna type, such as e.g. a patch antenna.

According to figure 1, the signal is guided from a first satellite through the horn 4, the signal from the second satellite is guided through the horn 6 and the signal from a third satellite is guided through the horn 8. At the reception of television signals or Internet signals from the first satellite, the control arrangement blocks the signal reception from the horns 6 and 8. The reception of signals from the second and the third satellite is achieved in a corresponding way. The

television signals and the Internet signals may be received from different satellites, independently of each other. If television signals are received from a first satellite, e.g. via the antenna 4, and Internet signals are received from a second satellite, e.g. via antenna 6, the control arrangement blocks the television signals from the antennas 6 and 8 and the Internet signals from the antennas 4 and 8.

According to one embodiment of the invention, the feeder element is provided with a mounting part 12 of which the outer shape is fitted to be mounted on a conventional parabolic antenna.

Figure 2 schematically shows components included in a micro head 14 according to one embodiment of the invention. The three feeder horns 4, 6, 8 receive television signals and Internet signals, respectively, from one satellite each. The satellites transmit television signals and Internet signals, respectively, as linearly polarized signals (horizontally or vertically polarized) or as circularly polarized signals, which are received by the feeder horns and forwarded to the control arrangement 16. The control arrangement separates Internet signals and television signals from each other by means of suitable filters, and selects the television signal and the Internet signal, respectively, to be forwarded. From the control arrangement, the selected signals are conducted to one or more LNB:s (low noise block down converter) 18, for the amplification of the signals and down-conversion of the frequencies, whereupon the signals are forwarded to a reception box and to a TV/computer, via one or more outputs.

A television signal from one satellite uses a certain frequency band, for example 10,7 - 12,75 GHz, while an Internet signal uses a different, adjacent frequency band. By means of the invented control arrangement, television signals and Internet signals, respectively, can be received simultaneously from the same satellite and by the same feeder horn. The invented control

arrangement, which is arranged in the micro head of the parabolic antenna, receives the signals from the antennas and filters the Internet signal and the television signal, respectively, to be forwarded to the LNB:s and further to a reception box and to a TV/computer via one or more outputs. Normally, the control arrangement is adapted to receive Internet signals continuously from one satellite, while the control arrangement is adapted to be actuated by the communication box to receive television signals from a certain satellite. At transmission of Internet signals, the reception of Internet signals must be temporarily interrupted by the communication box, whereupon the control arrangement is adapted for transmission.

Figure 3 schematically illustrates one embodiment of the invented control arrangement 16. Only the reception of signals from two feeder horns is disclosed in the figure, while the dotted lines in the figure indicate that the control arrangement may be adapted to control signals to and from an optional number of antennas, or at least one antenna. The input signals to the control arrangement 16, according to the figure 3, comprise one vertically polarized signal 36 or one horizontally polarised signal 38 from a first antenna, and one vertically polarized signal 40 or one horizontally polarized signal 42 from a second antenna. Alternatively, the input signals may be circularly polarized. The television signals and the Internet signals are separated from each other by means of suitable filters and are amplified by suitable components, whereby the filtered signal 20 comprises a received Internet signal from the first antenna and the filtered signal 22 comprises a received Internet signal from the second antenna. Correspondingly, the filtered signal 24 comprises a received television signal from the first antenna and the filtered signal 26 comprises a received television signal from the second antenna. Controllable switches 28, 30, 32, 34 regulate which one, if any, of the respective television

signal and Internet signal that is to be forwarded to the LNB:s as output signals 44, 46 from the control arrangement 16.

Normally, the Internet signal is received continuously from a certain satellite, except when the reception is interrupted for transmission of an Internet signal from a TV or a computer. At transmission of Internet signals, the Internet signals are forwarded the opposite way through the control arrangement compared to the illustration and description in connection with figure 3, and via a separate amplifier.

In the invented communication system, the feeder element is provided with a suitable number of antenna elements, or with at least one antenna element, preferably with feeder horns, depending on the number of satellites the user desires to communicate with. Since the antenna elements are adapted for communication of both television signals and Internet signals independently of each other and the control arrangement is adapted to select the antenna signals to be forwarded, merely one parabolic antenna on a home, a place of work or a school is sufficient for the reception of TV and for communication with the Internet, when it is provided with the invented satellite communication system. The invention may be arranged to be mounted on an existing, conventional parabolic antenna, providing cost-efficiency to the customer.

The present invention is not limited to the embodiments described above, and it may be modified within the scope of the appended claims.

CLAIMS

1. A communication system for satellite signals intended for a parabolic reflector (10), the communication system comprising a feeder element (2) and a control arrangement (16), the feeder element provided with at least one antenna element (4, 6, 8) arranged to receive television signals from one satellite and simultaneously receive or transmit Internet signals from or to the satellite, **characterised in** that the antenna elements (4, 6, 8), included in the feeder element (2), are arranged to communicate with one satellite each, via the parabolic reflector (10), that the control arrangement is arranged to receive television signals and Internet signals from the antenna elements (4, 6, 8), separate the television signals from the Internet signals and select and forward a television signal from one satellite and select and forward an Internet signal from the same or from a different satellite, respectively, or to forward an Internet signal for transmission.

2. A communication system according to claim 1, **characterized in** that the feeder element (2) is provided with additional antenna element (4, 6, 8) for communication with several satellites.

3. A communication system according to claim 1 or 2, **characterized in** that the antenna elements comprise feeder horns (4, 6, 8).

4. A communication system according to any of claim 1 - 3, **characterized in** that the control arrangement (16) comprises controllable switches (28, 30, 32, 34) to regulate which television signal and which Internet signal, respectively, that is to be forwarded.

5. A communication system according to any of the previous claims, **characterized in** that the feeder element is provided with a mounting part (12), the shape of which is fitted to be mounted on a parabolic antenna.

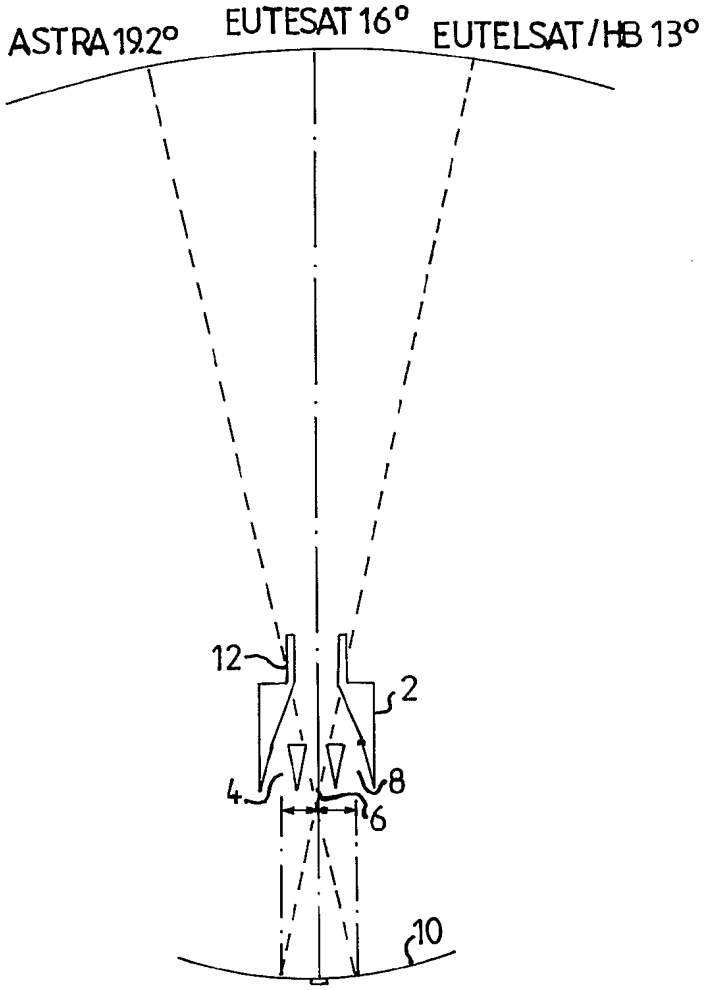

FIG.1

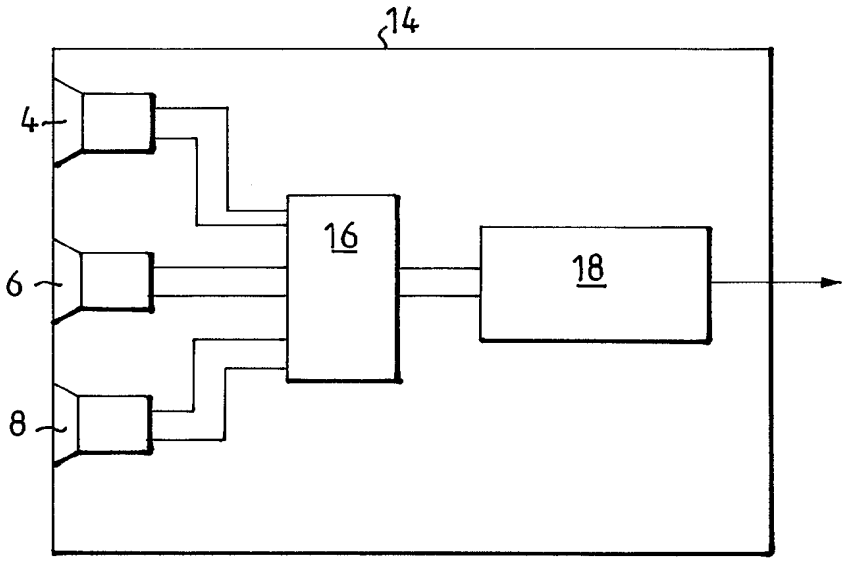

FIG. 2

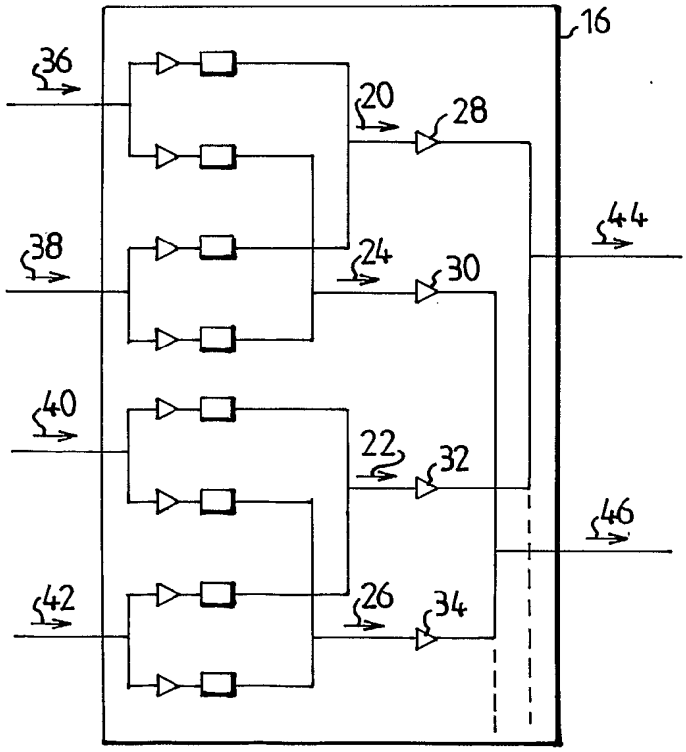

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 03/00928

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04B 1/18, H04B 1/40 // H01Q 13/02, H01Q 15/14
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H01Q, H04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5565805 A (NAKAGAWA, Y. ET AL), 15 October 1996 (15.10.96), column 2, line 27 - column 4, line 7, figures 1-2, abstract --	1-5
Y	WO 0165642 A2 (PRODELIN CORPORATION), 7 Sept 2001 (07.09.01), page 4, line 15 - page 5, line 19; page 6, line 14 - line 27; page 7, line 5 - line 25, page 22, line 24 - page 23, line 4; figures 1a,1b,3; abstract --	1-5
A	US 2002034165 A1 (RAM, U. ET AL), 21 March 2002 (21.03.02), page 2, paragraph [0025] - page 3, paragraph [0026]; figure 1 --	1-5

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search	Date of mailing of the international search report
21 July 2003	26 -08- 2003
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Anna Malmberg /OGU Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 03/00928

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	EP 1054468 A2 (ALPS ELECTRIC CO., LTD.), 22 November 2000 (22.11.00), column 5, line 39 - line 50; column 6, line 13 - line 19, figures 5,11, abstract ---	1-5
A	PATENT ABSTRACTS OF JAPAN Vol. 1998, No. 04, 31 March 1998 (1998-03-31) abstract & JP 09 326620 A (DX ANTENNA CO LTD) 16 December 1997 (1997-12-16) --- ---	5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 03/00928

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